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Abstract

TRANSFORMATIONS OF HIGHLY ENRICHED URANIUM INTO METAL OR OXIDE

DESIGN AND ENGINEERING OF WORKSHOPS

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THE ENRICHED URANIUM WORKSHOPS in CADARACHE have a double purpose : on the one hand to convert uranium hexafluoride into metal or oxide, and on the other hand to recover the uranium contained in scrap materials produced in the different metallurgical transformations.

The principles that have been adopted for the design and safety of these workshops are reported. The nuclear safety is based on the geometrical limitations of the processing vessels.

To establish the processes and the technology of these workshops, many studies have been made since 1960, some of which have led to original achievements.

The uranium hexafluoride of high isotopic enrichment is converted either by injection of the gas into ammonia or by an original process of direct hydrogen reduction to uranium tetrafluoride.

Translation provided by courtesy of the submitting Government

The uranium contained in uranium-zirconium metal scrap can be recovered by combustion with hydrogen chloride followed treatment of the uranium chloride by fluorine in order to obtain the uranium in the hexafluoride state.

Recovery of the uranium contained in various scrap materials is obtained by a conventional refining process : combustion of metallic scrap, nitric acid dissolution of the oxide, solvent purification by tributyl phosphate, ammonium diuranate precipitation, calcining, reduction and hydrofluorination into uranium tetrafluoride, bomb reduction by calcium and slag treatment.

Two separate workshops operate along these lines : one takes care of the uranium with an isotopic enrichment of up to 3 p.100, the other handles the high enrichments.

The handling of each step of this process, bearing in mind the necessity for nuclear safety, has raised some special technological problems and has led to the conception of new apparatus, in particular the roasting furnace for metal turnings, the nitric acid dissolution unit, the continuous precipitator and eversafe filter and dryer for ammonium diuranate, the reduction and hydrofluorination furnace and the slag recovery apparatus. These are described successively, together with the studies which led to their development.

The civil engineering construction was begun in june 1962. The workshops are to start production in may 1964.